Environmental education takes root in S.C. schools

By Jan Easterling

Demonstrations on how a swift river can create electricity fascinated Aubrey Gilbert when the James Island resident toured a hydro-electric plant during a summer outdoor adventure camp. A naturally curious teenager at the time, Gilbert had loved science, particularly aquatic-related issues, ever since her third-grade science experiment to determine which bait different fish species prefer.

But what she saw after the tour disturbed her: There, on the banks outside the hydro dam, were dead fish, one of the tradeoffs of the relatively pollution-free energy source.

Turbines in the plant's powerhouse that generate electricity also can suck in fish, injuring and killing them before they can escape. The dead fish floating along the bank spawned Gilbert's curiosity and interest in experimenting with ways to help fish find their way around turbine hazards.

For the next two years, the Gilbert home became awash in fish tanks as she set out to determine if she could influence fish behavior with magnetic fields or different light effects. In different years she worked with sturgeon, bluegill or striped bass to see if the lights could be used to steer fish away from the hazardous intakes. Magnetic fields proved inconclusive, but fish, particularly sturgeon, seemed to respond to white and yellow incandescent lights.

She has presented the results of her experiments at international science fairs and to national groups of fish researchers. Scholarships and awards have followed her through college, and she received a state Champions of the Environment award two years running for the fish study.

She also represents a generation of youth who, like her fish, are being stimulated to change behaviors through environmental education initiatives covering a gamut of topics from recycling to global warming. A large percentage of Gilbert's generation has grown up with interdisciplinary curricula

incorporating environmental protection and prevention with emphasis on our individual “ecological footprints.” They have been tasked with taking home their environmental knowledge and less than subtly influencing their parents’ behavior. And they have had opportunities to explore environmental problems and solutions through a plethora of both independent and classroom-based projects much more broadly available than their parents ever had.

But there’s more to be done for the following generations as the earth’s needs change. The “fix-it” technologies and policies of the ’70s and ‘80s are giving way to

prevention and sustainability. The numbers show the impact of growth: As South Carolina rolled into a new millennium, state residents increased their trash production to about 10 million tons despite seven straight years of recycling growth. Six areas of the state face air quality “attainment” problems that could lead to increased regulations on personal vehicles and industry emissions. An increasing number of waterbodies each year join the impaired list, and anglers are warned to reduce or eliminate fish consumption in some areas because of contaminants. Myrtle Beach traffic jams reflect the impacts on coastal areas of residential in-migration and tourism.

Observers say coming generations face troubling natural resource issues that will require them to make dramatic lifestyle changes and tough choices.

Are they prepared?

“I can see a time coming when people will have to live with limits,” predicts Lewis Shaw, deputy commissioner of Environmental Quality Control for the S.C. Department of Health and Environmental Control.

“It’s Draconian, but we have to rethink our ability to be mobile. I see air quality and automobile emission issues as among the most difficult for coming generations because it might require giving up freedom of choice.”

The task for educators is to create a new generation of environmentally aware decision-makers. “Within the next 40 years we could max out our resources,” notes Gilbert, who is considering a teaching career having graduated from college with a double major, one of which was distinguished honors in biology.

“We’ve got to slow down or we will have real problems. We need to teach

problem-solving, not just memorization, early in schools. We've got to teach children that there are different ways to look at things and how to think about things in a non-conventional way. We need new thinkers."

Environmental education takes root

Even before Congress recognized that environmental education should be an integral part of the U.S. Environmental Protection Agency's mission, environmental groups were developing and disseminating lesson plans and curricula. In recent years with population growth and shifting demographics vaulting to the top of environmental impact issues, updates have been sprinkled with more emphasis on the need for natural resource preservation and growth management.

With passage of the National Environmental Education Act in 1990, EPA set out to promote educational tools and strategies that promote sustainable use of the Earth's resources. "Environmental education contributes to sustainable development efforts by demonstrating ways to promote informed decision-making and teach the benefits of linking conservation and economic development," according to EPA's environmental education fact sheet.

What materials are taught in South Carolina classrooms is a local decision largely guided by the state science standards, said Linda Sinclair, education associate for science at the S.C. Department of Education.

"Teachers use the newly adopted S.C. science standards as a guide to the lessons they use. Any of the resources that they use need to correlate to the standards. With high-stakes testing in grades three through eight, teachers are interested in making sure that what they spend time on in the classroom is what students need to know when testing comes around," she said.

But "there are a lot of needs in environmental education. One is the need to have a state environmental education plan or samples of a syllabus for courses at the high school level," she added.

The classroom environmental initiatives supported by the S.C. Department of Natural Resources have as a goal "to make students as early as second and third

grades aware of the ecology. The goal is to develop a generation of young people making choices for themselves rather than being persuaded by some charismatic group," said Jack Hancock, an educator with the S.C. Department of Natural Resources.

Environmental concerns also are turning up more and more outside the science classroom and in areas such as civics and social studies. Horry County Soil and Water Conservation Specialist Sam Ward notes that it's not just science teachers who show up for his Summer Teacher Institute sessions. Sometimes it's math, English and even physical education teachers who sign up to learn more about local environmental topics.

An increasing number of colleges and universities as well are incorporating environmental education for nonscience majors into their course offerings. The University of South Carolina started a School of the Environment in 1995 to address present and future environmental concerns and promote efficient, environmentally safe use of natural and man-made resources to safeguard health and foster improvements. The school offers students an opportunity to become knowledgeable about environmental issues in the social, economic, political and scientific arenas.

"In the past, most of the emphasis was on technical training for engineers, biologists, and those who were more in the pure science of environmental protection," said DHEC's Shaw.

"During the 1970s, rivers were catching on fire, dioxins were turning up in drinking water; those were the types of environmental crises. Nationally, as people saw these disasters, environmental issues began to creep into the educational process. But those types of disasters are virtually a thing of the past. We've overcome the technical needs. We've developed the machinery we need to clean up the environment. Now it's time to get political will to factor in environmental concerns at the business level. We're moving away from fixing problems to the preventive mode and trying to predict the problems," Shaw said.

Others agree. "Since the first Earth Day 30 years ago, we've done the easy stuff. If we're going to deal with problems now, we have to deal with the social and community considerations," said Trish Jerman, a former executive director of the S.C. Wildlife Federation.

In general, there has been a growth in interest in environmental education Ben Blair of the EPA Region 4 environmental education section notes that “more and more schools throughout the country are beginning to emphasize environmental education in specific subjects or integrated throughout the curriculum. Even math and social studies teachers are incorporating environmental education into their curricula. It’s certainly not a time to back off; it’s a time to be more aggressive. It’s much cheaper to educate than to clean up.”

What’s in South Carolina schools?

DHEC launched development of the first statewide curriculum supplement for grades K-12 as a mandate of the S.C. Solid Waste Policy and Management Act of 1991. *Action for a cleaner tomorrow: A South Carolina Environmental Curriculum Supplement* brought together a statewide team of teachers along with the Department of Education, Clemson University’s Extension Service, and the state Keep America Beautiful affiliate to develop the program.

The draft curriculum went through an extensive statewide pilot program conducted by teachers in more than 100 schools. Phase-in statewide occurred in 1994-1995, and this past year more than 9,000 teachers, including teachers from every school district, had been trained on using the supplement. Training and materials cost nothing to teachers or districts.

Initially designed to address solid waste issues, *Action* has since been expanded to include lessons on air, water and energy. All lessons are hands on and topical. For instance, in one lesson age-appropriate for sixth through eighth graders, students study an issue that is among the most topical today for state and federal regulators and environmental groups: vehicle emissions and the smog they create.

South Carolina currently meets federal air quality standards, but during summer months regulators routinely anticipate exceedances, which would require states to reduce the amount of ground level ozone created by implementing regulatory requirements on consumers. The growing population and increased vehicle travel are primary sources of ozone pollutants and the obvious place to look for reductions.

A recent transplant to Atlanta, EPA's Blair despairs over that city's air quality and notes an increase in smog alerts in the pristine Smoky Mountains. Blair's wife suffers from asthma. "In the summer she can barely stand to be here," he said.

"That's where education comes in. If you can educate the public and Congress and say, 'Here's what you need to do, and if you don't, here are the consequences,' then we might could make some progress. If we don't do anything, we eventually will pay the price."

While adults grapple with policy issues surrounding environmental challenges, the implications of no action are not lost on students.

College freshman Beth Grove can recite big words like "spectrophotometer" without a blunder. She can spell it. She knows how to use one. She can tell you what economic, health and environmental impacts occur when South Carolina exceeds its ground-level ozone limit. Her knowledge and concern about ozone led her to a Champions of the Environment award in 1999.

Ground-level ozone is formed by a reaction between volatile organic compounds (VOCs) and oxides of nitrogen when they are exposed to sunlight. At high enough levels, ground-level ozone can irritate and damage lung tissue, reduce resistance to lung diseases, and aggravate existing lung diseases or asthma. Children and elderly people are most susceptible to the detrimental effects of ground-level ozone, but healthy adults who work or exercise outdoors also experience the unhealthy effects of ozone.

"South Carolina had failed its ozone standard (several years ago), and I wanted to find a way to measure the levels of ozone in the air in other places, rather than just where the big expensive machinery is," Grove said. Air quality caught her eye because "I started noticing how many things are in the air that we can't see. I started noticing how much pollution cars create and what they put in the air."

The Champions of the Environment program evolved from a nonpoint source water pollution education program to a comprehensive environmental education competition co-sponsored by DHEC, International Paper and WIS-TV. Champions recognizes students involved in environmental projects and activities at all grade levels. The program produces a series of environmentally oriented

television spots geared toward increasing environmental education, programs and awareness as well as recognizing student participants.

"Some of the projects these students are submitting are mind-boggling in their complexity," said Merritt Kearns, who coordinates the project at DHEC. "These students are dealing with issues, coming up with solutions to problems, and helping to educate the public all at the same time."

In her Champions project, Grove modified a previous air sampler developed by Craig Sealander, also a Champions winner, to test ground level ozone at her school, the Governor's School for Science and Mathematics in Hartsville, and in her hometown of Lugoff. Sealander's air sampler did not react to ozone. Grove had to come up with an absorbing solution and process that would. She hopes to see her low-cost ozone sampler used in residential neighborhoods that wish to check the ozone level. Another application of her ozone sampler might be to use it indoors to check for ozone leaks.

Governor's School chemistry professor Kurt Wagner encourages his students to participate in Champions. "I have high regard for the program. It puts environmental issues in front of the public, makes kids aware of issues, and keeps environmental problems and solutions in the public eye."

Some recent Champion projects:

Ø Paula Randler won a Champions recognition from painting "graffiti" on 1,100 storm drains outside a residential section containing primarily military families in Beaufort County. "We took a tour of DHEC, and Watch Watch coordinator Kim Gundler talked about the Storm Drain Stenciling projects. I thought it would be a good idea to bring that home to Beaufort. Especially living on an island, I wanted to bring the awareness home of what the impact is of pouring pollutants down storm drains, which eventually run into our waterways." Being military families, those now more aware of pollutants in storm drains are carrying their knowledge worldwide, she added.

Ø Abraham Funchess' Calhoun County students at John Ford Middle

School belong to the Environmental Club, which maintains a schoolyard habitat, presents environmental lessons to younger students, and writes environmental articles for the local newspaper. Students have also sent out a survey to determine the environmental knowledge of county residents. The survey, Funchess said, leads him to believe that students exposed to environmental studies and messages are more likely "to respond in a positive way with their actions."

As part of his environmental lessons, Fuchess enlisted rising sixth graders along with current sixth, seventh and eighth graders and faculty, staff, parents and St. Matthews residents to participate in the survey. On the bright side, 83 percent of respondents said they conserve energy by turning off lights when they leave a room, 69 percent spend less than 15 minutes showering, and 72 percent recycle aluminum cans. But only 22 percent believe that cars are the biggest polluter of the air. Few participants outside his students could say how much of the world's water is available for consumption or how many gallons of water could be contaminated when a single quart of motor oil is dumped down a street storm water drains.

"Adults are not as knowledgeable on the factual information, so we had kids go home and talk to them about things they weren't real aware of," Funchess said. "Young people are teaching adults to be more environmentally aware, and we are getting positive feedback."

Ø Mike Wallace of Myrtle Beach High School studied how the failure to recycle used motor oil at approved collection sites could cause problems with plants. Mike simulated illegal dumping of used motor oil in household waste and landfills by using different amounts of used oil mixed in with the soil. Mike then studied how the mungbean seeds grew in the different soils. The results show a decline in the growth of mungbean seeds as the level of used oil contamination increases. Mike chose the project to improve awareness of the proper methods of recycling used motor oil.

Environmentalists of the future

Education initiatives and outreach efforts to date have had an effect on increasing awareness of our ecological impact. But the focus is turning toward making stewardship a mindset.

“High school students today are much more advanced in their abilities to think in global terms than I was,” DHEC’s Shaw said. “They need to be exposed to broad policy pieces of environmental stewardship. There are inherent costs that are not easily seen when they’re developing business practices. It goes back to sustainability. They need to be taught to think the big picture, rather than to spend just enough money to meet some regulation without looking at long-term consequences.”

As early as 1970, the Council for Environmental Education, a nonprofit educational organization, formed to create a partnership and network between education and natural resource professionals. The group develops and disseminates environmental education materials and facilitates their development, including Projects WILD, WET and Learning Tree, which are all used in South Carolina schools.

On their horizon is a new supplement called “Urban WILD,” which will encompass lesson plans on land use planning issues. Students will role-play local government decision makers in “To Zone or Not to Zone” and “To Dam or Not to Dam” from the supplement, which contains many similar scenarios with the implied message that land use planning is key in environmental preservation, DNR’s Hancock said.

“This will help students look at the impact of urbanization on wildlife populations and the environment,” he said. “If you’re talking about water pollution, the best solution to prevent it is proper land use management. If your community values wetlands, then they need to be practicing good land use management.”

Students at the state’s three largest universities are getting hands-on stewardship lessons through the Sustainable Universities Initiative.

The initiative's goal is to "green" college campuses in the state by increasing awareness among students – and faculty and administrators -- of environmental impacts the institutions make. Initially a grant-funded effort by Clemson University, the University of South Carolina and the Medical University of South Carolina, the initiative has since expanded to other state schools. Planning began in 1997 with a goal of incorporating sustainability into the curricula of the three schools, improving campus operations and strengthening links with the larger community.

"A major effort is to make sure students and faculty understand the relationships between humans and the environment and how they fit into community. We have to ingrain personal responsibility into everything we teach as well as set a model for sustainability in our own operations," she said.

Broad goals of the initiatives are to effect a change within faculty, to develop student and community education programs, to conserve natural resources by making university operations more efficient, and to share information with others.

To do that, the initiative plans to or has already started faculty development through local and national workshops and conferences, seeking funding for faculty to address such things as environmental ethics, medicine and policy along with opportunities for faculty to develop new courses on sustainability, developing courses in honors colleges and materials for freshman orientation, bringing in speakers on sustainability, and finding funding for projects focused on making campus/community operations more efficient.

Similar initiatives in other parts of the country have shown their worth to the bottom line. Twenty-three campus projects were tracked for a National Wildlife Federation report "Green Investment, Green Return." Cost savings averaged $728,500 for the projects. Individual project savings ranged from $1,000 to about $9 million. Projects ranged in size and subject matter from transportation, energy and water conservation, materials reuse and redistribution, composting, recycling and management of hazardous chemicals.

Similarly, Jerman expects Sustainable Universities to have an effect on operations. "Students are encouraged to identify a problem, come up with a solution, and write a grant to fund it." Some of those projects:

Ø Parking had become such a problem on the USC campus that some students decided to pursue getting the campus shuttle buses to begin making runs to the outlying apartment complexes where large numbers of students live. Legal issues prevented that from occurring, but based on the students' concerns, the university is negotiating a similar pickup with the city transportation system.

Ø A student surveyed and gathered items from one dorm that were thrown in the trash simply because the students didn't want to carry them home at semester's end. The student collected literally truckloads of perfectly good items, including things like a never-worn sweater, that were headed for the landfill and diverted them to charity.

Ø One student wondered why USC spent so much time and effort maintaining small patches of grass that required manpower and time-intensive mowing. She mapped their locations on a Geographical Information System and made a successful argument for cost savings, including reducing the mower exhaust to the environment, if the areas were mulched.

Ø USC has recently converted all of its dorm washing machines to environmentally friendly front-loading models. The change will save 2 million gallons of water a year and will reduce overall energy costs and usage in the laundry rooms by 24 percent annually. The change occurred when an administrator learned of the cost-saving benefits. "A lot of what could be done isn't being done simply because no one has brought it to anyone's attention," Jerman said.

Personal change, however, can prove difficult. "Students are interested in thinking about these issues, but I don't know yet whether they are interested in

making personal sacrifices," Jerman said.
"We have enormous potential to change our 'product,' but to change our product, we've got to think about the world of the future and tweak the product to meet the circumstances of that world," she said.

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